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To: Medical Officer in Command

Subj: Monthly Report of the Experimental Work of the Artificial Limb Department

Ref: (a) Advisory Committee on Artificial Limbs ltr dtd 21 June 1948.

1. Monthly report required by reference (a) is hereby submitted. Oct
2. Commander T. J. Canty, MC, USN and Ensign R. M. Ware, MSC, USN, attended the meeting of the Advisory Committee on Artificial Limbs, National Research Council, in Minneapolis, Minnesota, 18--20 October 1948.
3. The following projects are under production, experimentation and further study:

(a) Lower Extremities Section

I. Foot and ankle

The functional ankle joint utilizing the single cable is being fitted on a number of amputees. The last report on accelerated testing at the University of California reveals that this ankle has gone over one and one-half million cycles. This is computed to be on the average amputee walking of approximately eight to ten years. As suggested by the University of California for more durability in flexion and extension of the ankle with individual adjustment of rotation, consideration is being given in the redesign of the quality and shape of the rubber bumper.

II. Shank

A number of plastic shanks have been built utilizing the combination of fortisan and fibreglass as the laminate. These shins were crushed under the hydraulic press. The new combinations show only slight increase in strength over plastic shins built utilizing fortisan as a laminate. It is felt that the addition of fibreglass as a laminate is unnecessary, especially due to the fact that it takes a great deal more work in the manufacturing as compared when using fortisan laminate alone.

III. Knee

A. Mechanical

The functional above knee joint which provides rotation at the knee, in our opinion, is not necessary providing rotation is allowed at the ankle.

IV. Cosmetic Problem

Additional clay models of norms of the lower extremities are being made in order to provide cosmetic contour and shape for the artificial limb. It is intended to include a knee and ankle section which will match the human knee and

ankle part in cosmetic shape.

Work on the cosmetic covering is continuing and a new Latex foam has been provided which is more durable than Spectrofoam.

V. Brief summary of status of models as a unit.

Four additional below knee suction sockets are being fitted on amputees.

No further work has been done on the slip socket for short below knee stumps.

The functional below knee joints have been fitted on an amputee and provides increased function about the knee joint, especially when sitting down, and allows the knee to travel with the prosthesis upon walking and stair climbing. It is intended to redesign this joint utilizing the working principle.

The flexible plastic lining as a substitute for horsehide in the soft socket appears to be an improvement.

(b) Upper Extremities Section

I. Arms.

The Robin-Air flexion unit is being worn by amputees to advantage. The functional elbow joint has been redesigned and by providing a left and right hand thread, the stays can be incorporated in the plastic cuff and forearm shells. The sockets are made as short as possible which increases the pronation and supination.

II. Hands, Hooks, and Tools.

The Robinson artificial hands of the latest design are being fitted on amputees.

III. Cosmetic Problem

No further work has been done on the cosmetic problem of the arm.

IV. Harness and/or other outside control.

The single strap harness for above elbow arm is proving satisfactory and all cases are being changed to that type of hook-up.

V. Brief summary of status of models as a unit.

Below and above elbow suction sockets are being fitted to amputees and are working successfully.

The Robin-Aid above elbow arm has been tried on two different amputees and requires too much force to operate. A redesign of the mechanism is being considered.

A shoulder disarticulation prosthesis with the provision of a shoulder joint is in the drafting stage and it is felt that this will give an amputee with a disarticulation additional use of an artificial arm.

lightness. Ankle blocks have been carved including the malleoli thereby eliminating two sections which have been used heretofore.

III. Knee

A. Mechanical

The functional above knee joint utilizing a sold metal post has been fitted to an amputee and is working satisfactorily.

The standard above knee joint has been redesigned to provide a new stop which will permit 120° flexion in all types of stumps including long stumps which reach to the knee bolt.

B. Hydraulic

The hydraulic AK knee joint which is used in conjunction with the tilting table prosthesis is being assembled.

IV. Cosmetic Problem

A clay model of a norm of the lower extremity has been made and a shin and ankle have been constructed from the model in order to provide a more natural shape and contour for the lower extremity. One-fourth inch sponge rubber (spectrafoam) has been used as a covering for the lower leg which is in turn sprayed with liquid Latex to provide a durable skin. This combination produces a good cosmetic covering which matches the human leg in color, contour, and resiliency, and further water and dustproof the limb.

V. Brief Summary of status of models as a unit.

Below knee suction prostheses are being fitted and are working satisfactorily. Work continues on the development of improved fitting methods.

A slip bucket prosthesis for short below knee stumps has been constructed utilizing the principle of a metal bellows attached to the platform in the shank which provides up and down motion to the socket thereby eliminating the outside elastic straps.

knee

A set of functional BK/joints has been constructed and fitted on an amputee and provides the necessary motion of the joint axis travelling up and back during the walking cycle and sitting. This reduces the forces which tend to pry the stump out of the socket.

A flexible plastic liner is being utilized as a substitute for horsehide in a soft socket and appears to have the advantage over leather from the hygienic standpoint and in addition it does not pack after wearing which does occur with horsehide.

(b) Upper Extremities Section

I. Arms

The Robin-Aid flexion unit is being worn by two amputees and it is

proving to be of help in dressing, eating, writing, shaving, automobile driving, doing work of a mechanical nature, and in various recreational activities; example, playing cards. The amputee utilizes the device on the average of ten activities daily.

The functional elbow joint is being used routinely and the length of the socket has been shortened to the minimum thereby providing additional pronation-supination.

II. Hands, Hooks, and Tools.

Sixteen new Robinson hands of the latest design are being constructed and will be fitted on amputees for further field testing. It is felt that the artificial hand should be provided with automatic lock and force multiplier. The present manual lock is working satisfactorily but it requires the use of the opposite hand for operation. The forces provided at the finger tips are sufficient for 80% of the daily activities of the amputees, but it is felt that with the force multiplier it would provide additional power to the fingers.

IV. Harness and/or other outside control.

Three above elbow amputees have been fitted with a Navy-Fitch arm utilizing a single strap for harness control. This is a big improvement over the double harness from the standpoint of both power applied to the prosthesis and comfort to the amputee.

V. Brief summary of status of models as a unit.

Below elbow suction sockets are being fitted utilizing an opening in a closed end socket with a slide cover externally. Above elbow suction sockets are also being fitted successfully and are an improvement over non-suction sockets because the stump is more intimately connected to the prosthesis and there is no loss in motion between the stump and the socket. It further tends to give the amputee a feeling that the prosthesis becomes an intimate part of his arm and the amount of the dead weight feeling is reduced.

A Robin-Aid above elbow arm is being fitted to a patient in order to provide amputee testing of this device.

A shoulder disarticulation has been fitted to a patient and it is apparent that there is a need for motion at the shoulder joint and a model has been set up to provide both shoulder and elbow motion on the same cable.

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